

CLAIMS:

What is claimed is:

- 1 1. An apparatus comprising:
2 a main memory for storing data;
3 one or more I/O devices for receiving data from or sending
4 data to said main memory;
5 a control unit for controlling said I/O devices;
6 an I/O processor (IOP) for controlling I/O operations for
7 sending data between said main memory and said I/O devices;
8 disparate channels between said IOP and said control unit,
9 said disparate channels including multiple channel paths for
10 carrying data between said main memory and said I/O devices
11 during said I/O operations; and
12 a computer program executed by said IOP for assigning a path
13 weight to selected ones of said channel paths whereby the next
14 channel path to carry data between said main memory and said I/O
15 devices is selected.
- 1 2. The apparatus of claim 1 wherein said disparate channels
2 includes more than one type of channels.
- 1 3. The apparatus of claim 1 wherein said disparate channels
2 comprises one or more channel types including ESCON channels,
3 FICON bridge (FCV) channels, or FICON Native (FC) channels.
- 1 4. The apparatus of claim 2 wherein said computer program
2 includes an algorithm for assigning a path weight to a channel
3 path candidate dependent upon the type of channel containing the
4 channel path candidate.

1 5. The apparatus of claim 4 wherein the next channel path
2 candidate is selected by a round robin algorithm.

1 6. The apparatus of claim 4 comprising channel busy data (CBD)
2 stored by each channel for containing the status of channel
3 paths in the respective channel, and an IOP copy of said CBDs
4 stored by said IOP, and said computer program includes an
5 algorithm for using data in said CBDs for assigning a path weight
6 to a channel path candidate.

1 7. The apparatus of claim 6 wherein said computer program
2 classes a channel path candidate as a great candidate, a bad
3 candidate, or an OK candidate dependent on the value of the given
4 channel path's path weight value, said computer program further
5 including an algorithm for selecting the channel path candidate
6 to initiate the I/O operation on if it is classed as a great
7 candidate, evaluating the next candidate if it is classed as an
8 OK channel path or a bad channel path, or selecting the OK
9 candidate with the least path weight to initiate the I/O
10 operation on if there are no great candidates found while
11 rejecting any bad candidates.

1 8. The apparatus of claim 7 further comprising multiple IOPs,
2 each channel path having an affinity to one IOP, a work queue
3 having work elements for each IOP, and said computer program
4 comprises a loop for determining the best class of available
5 candidates, and from that class picking the candidate that has
6 affinity to the IOP with the least number of work elements on its
7 work queue.

1 9. A data processing system having a main memory for storing
2 data, one or more I/O devices for receiving data from or sending
3 data to said main memory, and an I/O processor (IOP) for

4 controlling I/O operations for sending data between said main
5 memory and said I/O devices, an apparatus for selecting paths
6 between the main memory and the I/O devices comprising:
7 disparate channels between the IOP and the I/O devices, said
8 disparate channels including multiple channel paths for carrying
9 data between the main memory and the I/O devices during the I/O
10 operations; and
11 a computer program executed by said IOP for assigning a path
12 weight to selected ones of said channel paths whereby the next
13 channel path to carry data between said main memory and said I/O
14 devices is selected.

1 10. The apparatus of claim 9 wherein said disparate channels
2 includes more than one type of channels.

1 11. The apparatus of claim 9 wherein said disparate channels
2 comprises one or more channel types including ESCON channels,
3 FICON bridge (FCV) channels, or FICON Native (FC) channels.

1 12. The apparatus of claim 10 wherein said computer program
2 includes an algorithm for assigning a path weight to a channel
3 path candidate dependent upon the type of channel containing the
4 channel path candidate.

1 13. The apparatus of claim 12 wherein the next channel path
2 candidate is selected by a round robin algorithm.

1 14. The apparatus of claim 12 comprising channel busy data (CBD)
2 stored by each channel for containing the status of channel
3 paths in the respective channel, and an IOP copy of said CBDs
4 stored by said IOP, and said computer program includes an
5 algorithm for using data in said CBDs for assigning a path weight
6 to a channel path candidate.

1 15. The apparatus of claim 14 wherein said computer program
2 classes a channel path candidate as a great candidate, a bad
3 candidate, or an OK candidate dependent on the value of the given
4 channel path's path weight value, said computer program further
5 including an algorithm for selecting the channel path candidate
6 to initiate the I/O operation on if it is classed as a great
7 candidate, evaluating the next candidate if it is classed as an
8 OK channel path or a bad channel path, or selecting the OK
9 candidate with the least path weight to initiate the I/O
10 operation on if there are no great candidates found while
11 rejecting any bad candidates.

1 16. The apparatus of claim 15 further comprising multiple IOPs,
2 each channel path having an affinity to one IOP, a work queue
3 having work elements for each IOP, and said computer program
4 comprises a loop for determining the best class of available
5 candidates, and from that class picking the candidate that has
6 affinity to the IOP with the least number of work elements on its
7 work queue.

1 17. A method for selecting channel paths in a data processing
2 system having a main memory for storing data, one or more I/O
3 devices for receiving data from or sending data to said main
4 memory, an I/O processor (IOP) for controlling I/O operations for
5 sending data between said main memory and said I/O devices, and
6 disparate channels between the IOP and the I/O devices, said
7 disparate channels including multiple channel paths for carrying
8 data between the main memory and the I/O devices during the I/O
9 operations, said method comprising:
10 assigning a path weight to selected ones of said channel
11 paths; and

12 selecting the next channel path to carry data between said
13 main memory and said I/O devices based on said path weight.

1 18. The method of claim 17 comprising including more than one
2 type of channel within said disparate channels.

1 19. The method of claim 17 further comprising including within
2 said disparate channels, one or more channel types including
3 ESCON channels, FICON bridge (FCV) channels, or FICON Native (FC)
4 channels.

1 20. The method of claim 18 further comprising assigning a path
2 weight to a channel path candidate dependent upon the type of
3 channel containing the channel path candidate.

1 21. The method of claim 20 further comprising selecting the next
2 channel path candidate by a round robin algorithm.

1 22. The method of claim 18 comprising storing channel busy data
2 (CBD) by each channel, said CBD containing the status of channel
3 paths in the respective channel, and storing by said IOP, an IOP
4 copy of said CBDs, and said using data in said CBDs for assigning
5 a path weight to a channel path candidate.

1 23. The method of claim 22 further comprising:
2 classifying a channel path candidate as a great candidate, a
3 bad candidate, or an OK candidate dependent on the value of the
4 given channel path's path weight value; and
5 selecting the channel path candidate to initiate the I/O
6 operation on if it is classed as a great candidate, evaluating
7 the next candidate if it is classed as an OK channel path or a
8 bad channel path, or selecting the OK candidate with the least

9 path weight to initiate the I/O operation on if there are no
10 great candidates found while rejecting any bad candidates.

1 24. The method of claim 23 wherein said data processing system
2 includes multiple IOPs, each channel path having an affinity to
3 one IOP, a work queue having work elements for each IOP, and said
4 method further comprises:

5 performing a loop for determining the best class of
6 available candidates; and

7 from that class, picking the candidate that has affinity to
8 the IOP with the least number of work elements on its work queue.

1 25. A program product usable with in a data processing system
2 having a main memory for storing data, one or more I/O devices
3 for receiving data from or sending data to said main memory, an
4 I/O processor (IOP) for controlling I/O operations for sending
5 data between said main memory and said I/O devices, and disparate
6 channels between the IOP and the I/O devices, said disparate
7 channels including multiple channel paths for carrying data
8 between the main memory and the I/O devices during the I/O
9 operations, said program product comprising:

10 A computer readable medium having recorded thereon computer
11 readable program code means for performing the method comprising:

12 assigning a path weight to selected ones of said channel
13 paths; and

14 selecting the next channel path to carry data between said
15 main memory and said I/O devices based on said path weight.

1 26. The program product of claim 25 wherein said method
2 comprises including one or more type of channel within said
3 disparate channels.

1 27. The program product of claim 25 wherein said method further
2 comprises including within said disparate channels, one or more
3 channel types including ESCON channels, FICON bridge (FCV)
4 channels, or FICON Native (FC) channels.

1 28. The program product of claim 26 wherein said method further
2 comprises assigning a path weight to a channel path candidate
3 dependent upon the type of channel containing the channel path
4 candidate.

1 29. The program product of claim 28 wherein said method further
2 comprises selecting the next channel path candidate by a round
3 robin algorithm.

1 30. The program product of claim 26 wherein said method
2 comprises storing channel busy data (CBD) by each channel, said
3 CBD containing the status of channel paths in the respective
4 channel, and storing by said IOP, an IOP copy of said CBDs, and
5 said using data in said CBDs for assigning a path weight to a
6 channel path candidate.

1 31. The program product of claim 30 wherein said method further
2 comprises:

3 classifying a channel path candidate as a great candidate, a
4 bad candidate, or an OK candidate dependent on the value of the
5 given channel path's path weight value; and

6 selecting the channel path candidate to initiate the I/O
7 operation on if it is classed as a great candidate, evaluating
8 the next candidate if it is classed as an OK channel path or a
9 bad channel path, or selecting the OK candidate with the least
10 path weight to initiate the I/O operation on if there are no
11 great candidates found while rejecting any bad candidates.

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